electromagnetic actuators **205** would lower the frame when operating in a pointing/gesture mode such that the tops of the key edge ridges **206** are flush with surface cover **203**, thereby providing a substantially smooth surface for pointing and gesturing. Although electromagnetic actuators **205** are depicted as being disposed beneath the frame and above the enclosure bottom, they may be disposed in any arrangement that allows them to suitably displace the frame **204** and key edge ridges **206**.

[0031] Preferably, each key edge comprises one to four distinct bars or Braille-like dots. When constructed in conjunction with a capacitive multi-touch surface, the key edge ridges should separated to accommodate the routing of the drive electrodes, which may take the form of rows, columns, or other configurations. As an alternative to key edge ridges **206**, the frame could cause Braille-like dots or similar markers, as discussed above with respect to FIGS. **1-4** to protrude through the key centers, although this arrangement would potentially interfere with touch detection and measurement because it would require mechanical devices in proximity to the key center, which is a preferred sensor location. In yet another alternative arrangement, articulating frame **204** could be disposed above the electrode circuit board **202**, although the added separation between the surface cover **203** and the circuit board **202** could complicate the touch measurement and detection.

[0032] The electromagnetic actuators may be located at the corners and/or center of the frame or distributed variously throughout the frame. Selection of a particular position will necessitate the determination of a variety of design parameters, such as frame material strength, power routing, cost, etc., all of which would be within the abilities of one skilled in the art having the benefit of this disclosure. The actuators **205** may be activated manually, for example, by touching the surface in a particular region, pressing a dedicated button, activating a switch, etc. Alternatively, the actuators raise and lower the frame according to mode commands from gesture and typing recognition software, such as that described in the '846 patent incorporated by reference above.

[0033] Specifically, the recognition software commands lowering of the frame when lateral sliding gestures or mouse clicking activity chords are detected on the surface. Alternatively, when homing chords (i.e., placing the fingers on the home row) or asynchronous touches (typing activity) is detected on the surface, the recognition software commands raising of the frame. Various combinations or subsets of these recognition techniques could also be used. For example, the device may activate a typing mode when homing chords or asynchronous touches are detected and deactivate the typing mode if neither is detected for a some time interval. In this configuration the device effectively defaults to a pointing mode and switches to a typing mode when necessary. Conversely, the device could activate a pointing mode when lateral sliding gestures or mouse clicking activity is detected and switch to a typing mode when these activities are not detected for some time interval. In any case, the frame will change modes automatically from lowered and flush (pointing mode) to poking through the surface (typing mode) as often as the operator switches between pointing and typing. Of course, operators who did not like the automated behavior could manually toggle the frame state with a pre-assigned gesture.

[0034] When extended, the key edge bars **206** provide similar tactile feel to a conventional mechanical key edge when the finger straddles two keys. However, this arrangement does not effectively simulate the concave depression common in mechanical keycaps, which helps a typists fingers sink towards the key center. Obviously, the key edge bars **206** will only be felt if fingers touch way off key center. Additionally, the holes in surface cover **203** through which the key edge bars **206** extend may collect dirt and grime. However, an extension of this arrangement may be used to address these concerns.

Articulating Frame Deforms Surface Cover at Key Edges During Typing

[0035] Illustrated in FIGS. **8**A and **8**B is a variation of the articulating frame arrangement discussed above with respect to FIGS. **5**, **6**, and **7**. FIG. **8**A shows the frame in the raised (typing) position, while FIG. **8**B shows the frame in the lowered (pointing, gesturing, etc.) position. In this embodiment, the bars of articulating frame **304** protrude through the circuit board **302**, but not through the surface cover **303**. When actuators **305**, disposed between enclosure base **301** and the articulating frame **304** raise frame **304**, the bars **306** lift the surface cover **303**, rather than poking through. By tacking the surface cover **303** to the circuit board **302** at the key centers, a concave keycap depression effect **307** will be created when the frame raises. This allows a users fingers to be guided toward the center of each key, much like a conventional keyboard. Additionally, because there are no holes in the surface cover **303**, there is likely to be less accumulation of dirt and grime on the surface. Obviously, such an arrangement requires a more supple cover material than the rigid Lexan (polycarbonate) sheets often used as touchpad surfaces, but a variety of such materials are well known to those skilled in the art.

Rigid Frame Under Key Edges with Compressible Key Centers

[0036] Yet another embodiment may extends the covered key edge bars and key center depressions while dispensing with the mechanical complexity of frame articulation. Such an embodiment is illustrated in FIG. **9**. The surface keyboard **400** comprises the familiar layers of an enclosure base (not shown), sensing circuit board **402** (with electrodes **402***a*), and surface cover **403**. The surface cover sits atop a frame including a fixed network of hard key-edge ridges **404**, which are preferably raised about 0.5-1 mm above the sensing circuit board **402**. The gaps between the key edge ridges **404** are filled with a compliant gel or foam material **405** (or possibly even air) filling the key centers up to flush with the ridges.

[0037] This arrangement allows the surface cover **303** to drape substantially perfectly flat, and remain flat when under light pressure, e.g., that from a pointing or dragging operation. However, when a user presses a key center, the cover would give under their finger somewhat as the foam/gel/air material **405** is compressed, while a user pressing over a key edge would feel the hard ridge underneath. While this arrangement is electrically and mechanically simple (with no active mechanical parts), the surface cover and key filler materials must be chosen carefully to provide noticeable compression at key center yet be durable to wear. Additionally, the sandwich of surface cover and foam could become too thick for the capacitive sensors to properly detect through. To overcome these deficiencies, the surface cover **303** itself could contain flex circuitry (well known to those skilled in the art) imprinted with a suitable electrode pattern, which would dispense with the necessity of the electrode layer **402**.